

Pollution of Water and ITS Effects on Fisheries

***Dr. Kumari Sugandha Priya**

Abstract

Every organism produces some polluting waste product, but in a balanced ecosystem, the wastes of one kind of organism are used as food by another, so that they do not accumulate and are broken down, and there is no 'unfavorable' alteration. However, during the recent years, explosion in human population and industrialization, have resulted in the discharge of excessive amounts of waste material into the environment.

Industrialization and increase in the human population of large cities results in the rivers becoming the drains of waste material. Domestic wastes, sewage and industrial effluents are generally allowed to be added to the rivers without any pretreatment, causing pollution of water. The waste products of some of the industries are extremely poisonous to fish life, and cause depletion of fish population by adverse changes in the physical, chemical and biological properties of fresh water. In addition to the industrial and domestic wastes, a large number of agricultural pesticides and insecticides have further increased the hazards of pollution of water.

POLLUTION OF WATER FROM SOIL EROSION AND SEDIMENTATION

Under natural condition, lakes and ponds are generally *Oligotrophic* i.e., the water is nutrient poor. Being fed by clear rivers and streams, there is a limited growth of phytoplankton. Benthic plants (*benthos=deep*) maintain high level of dissolved oxygen in deeper waters, as oxygen from photosynthesis is dissolved directly in water. Thus a nutrient poor body of water is able to maintain a rich, diverse ecosystem of fish, Mollusca etc.

As erosion and leaching occurs, a lake or pond is gradually filled with sediments containing nutrients such as nitrates, phosphates, potassium etc. this results in higher growth of phytoplankton. Water become turbid and the benthic plants do not get sunlight reducing photosynthesis. Oxygen produced by photosynthesis of phytoplankton supersaturates the upper water and escapes to the surface. It does not replenish the dissolved oxygen of deeper water.

Pollution of Water and ITS Effects on Fisheries

Dr. Kumari Sugandha Priya

POLLUTION THROUGH INDUSTRIES:

In India, pollution of river water takes place at various centers of industrialization, chiefly at Bombay, Calcutta, Madras, Kanpur, Delhi and Sindri, where there is a heavy concentration of factories and mills. At Bombay, a large number of industries dealing with aluminium steel and iron, textiles, chemicals, synthetic goods, petro-chemicals, pesticides etc., discharge their highly acidic wastes into the canals and rivers, thus affecting the fishes. At Calcutta, a large number of industrial complexes are located on both sides of the river Hoogly and discharge their wastes into it. The main pollution sources are the wastes from paper and pulp, textiles, distillery and chemical factories. The effect of pollutants extends to several kms. From the site of discharge, reducing the plankton and other food of fishes in the affected area. In addition to industrial wastes, domestic sewage from the enormous Calcutta population is discharged into the river Kulti, causing unfavorable effects to fish fauna in 20-30 Km area. This reduces the plankton and other organisms considerably, so that several fish species have been virtually eliminated.

At Kanpur, liquid wastes from a large number of tanneries, textiles, woolen and jute mills, are discharged into the river Ganga. DDT and the chloral hydrate are the chief pollutants of the river Jamuna at Delhi. A number of sugar factories located at various centres in Uttar Pradesh, discharge their wastes into the river Ganga, causing heavy pollution of water.

POLLUTION THROUGH DOMESTIC SEWAGE:

In India domestic sewage from most of the big cities, is allowed to be discharged into the rivers without any treatment to render it harmless. Only a few cities possess facilities for even partial or primary treatment. Even big cities like Kanpur, Ahmedabad and Bangalore do not have arrangement for pretreatment of sewage disposal. Hence, the river water has become considerably polluted in the nearby areas.

Untreated sewage and laundry detergents coming from the household when added to the rivers, increase the amount of sulphates, nitrates and chlorides considerably. These compounds favour the growth of algae, producing water blooms which consume most of the oxygen from water and cause toxic effects. The raw sewage causes depletion of oxygen also, resulting in the collapse of the aquatic ecosystem. Organic matter present in sewage is readily consumed by decomposers and detritus feeders, which consume oxygen also in their respiration. Thus, oxygen is further reduced in water which becomes unsuitable for supporting fish, Mollusca and other animals. Due to bad odor of many waste products, the water also smells bad and becomes unsuitable.

POLLUTION BY FERTILIZERS AND INSECTICIDES:

The use of pesticides to control agricultural pests is now increasing every day. Several kinds of insecticides like DDT are used in large quantity to control diseases like malaria and filarial. These chemicals are poisonous and are washed into the rivers, tanks and ponds endangering fish life. The important pesticides and insecticides are DDT, eldrine, dieldrine, benzene, hexachloride, endosulphan, endrex, folidol, demeton, phosphamidon etc. Chemical fertilizers used in agricultural

Pollution of Water and ITS Effects on Fisheries

Dr. Kumari Sugandha Priya

fields like urea and superphosphates are washed down into fishery ponds and nursery tanks, and prove to be harmful to all sorts of organisms. Studies indicate that organochlorine pesticides (OCs) are far more toxic than organophosphorous compounds (OPs). It has also been shown by laboratory experiments that a mixture containing pesticides belonging to different groups. (Ops and OCs) are far more toxic to fishes than when they are alone. This is called joint toxicity.

POLLUTION BY RADIO-ACTIVE WASTES

In the modern scientific age, various kinds of radio isotopes are used by man for various purposes, like heating home, preserving food, powering industries, fuelling transport, in medicine and research. Wastes from atomic reactors and plants containing different radioactive isotopes are the most dangerous which affect the aquatic life to a great extent. They cause gene and chromosomal mutations and damage body tissues in different ways. They may accumulate in the body of fishes and other aquatic animals harming them, as well as man who eats them.

OIL POLLUTION:

Large quantities of oil discharged into water, either by accident or by design, is extremely toxic and immediately affects the living organisms. The severity of oil pollution was felt in the recent Iraq war, when a large number of oil wells in Kuwait were put on fire, and huge quantity of oil from wells was allowed to flow out into the sea. The dense smoke from the burning oil polluted the atmosphere, and the oil spilled over the surface of the sea formed a thick layer on the water polluting it. As a result hundreds of fishes and birds died.

Oil pollution has become a serious problem of the sea water all over the world. Accidents occurring due to collision or fire result in the leakage of large quantities of oil from ships and tankers. Oil reservoirs and offshore oil fields are also a source of pollution of sea water. Both the east and west coasts of India are reported to show pollution due to oil spillage. The water of Mahim bay of Bombay coast is heavily contaminated from the effluents of oil and oil products. Marine water pollution affects marine organisms, causing depletion of fisheries.

POLLUTION OF GROUND WATER:

Ground water is generally considered to be of good quality and fit for drinking without any pretreatment. However, ground water also becomes polluted with toxic chemicals. Water that percolates through soil carries dissolved chemicals with it. Hence, any chemical used or disposed of, spilled or leaked can contaminate ground water. Major sources of the pollution of ground water are leaking underground storage tanks and pipe lines, pesticides and fertilizers used in agriculture, lawns and gardens and sewage water. Ground water often becomes polluted with heavy metals such as lead, mercury, arsenic, cadmium tin, chromium, zinc and copper that are widely used in various industries.

BIOACCUMULATION AND BIOMAGNIFICATION:

Heavy metals and halogenated hydrocarbons are particularly harmful because they tend to bio accumulate. Small apparently harmless doses of these chemicals, received over a long period of time,

Pollution of Water and ITS Effects on Fisheries

Dr. Kumari Sugandha Priya

may accumulate in the body, finally reaching toxic level and causing harm. Heavy metals cannot be broken down or destroyed by chemical process and are 'non-biodegradable', and hence are able to accumulate in the body. Although, these chemicals are easily absorbed into the body, they are excreted very slowly resulting in bioaccumulation, which may be further enhanced in the food chain. Organisms at the bottom of the food chain absorb the chemicals from the water and accumulate it in the tissues.

ACID RAIN

Acid rain refers to rain, fog, mist or snow which is more acidic than normal. During the recent years, large areas in North America, Europe and other industrialized countries are regularly experiencing precipitation or rain which is 10-1000 times more acidic than normal. Normal rainfall is slightly acidic (pH 5.6) because carbon-dioxide in the air dissolves easily in water forming a weak carbonic acid. However, in most industrialized parts of the world, the pH of the rain is 5.5 or less. For example, in eastern USA, Canada and Europe, pH of the rain is typically 4.5, and in some areas it is 4.0 only. This is due to the presence of sulphuric and nitric acid in water, which is on account of the presence of sulphur and nitrogen in air. It is well known that burning of fuel (coal) produces SO_2 and NO_2 which react with water vapor, through a number of steps forming acids. Rain, fog, snow becomes acidic due to the presence of these acids in the atmosphere.

OBSERVATION:

Various types of pollutants mentioned above prove to be harmful to the fishery either directly or indirectly as mentioned below:

1. These is increase in the osmotic pressure.
2. The water becomes acidic and pH lowered below 4.
3. The bring about oxygen depletion.
4. The toxic substances injure the mucous membrane of the gills and prove to be fatal, by effecting respiration.
5. The suspended matter injures the gills causing mechanical damage to the soft parts.
6. Pollutants reduce the zoo-and phyto-plankton and other aquatic organisms, thus indirectly affecting the fish by food depletion.
7. The spawning grounds and nesting material are destroyed, preventing natural spawning of fishes.
8. The fish flesh gets foul odor due to certain pollutants, and becomes unpalatable.
9. Sewage and silt bring about an early ageing of the lakes and ponds.

CONCLUSION

Experiments conducted during the recent years have shown that besides insecticides, fungicides and fertilizers, heavy metallic ions are also injurious to fresh water fishes. Pant, Kumar and Khanna

Pollution of Water and ITS Effects on Fisheries

Dr. Kumari Sugandha Priya

(1980) have reported acute toxicity of zinc sulphate and copper sulphate to *puntius conchoni*. Toxicity of metal to fishes varies greatly depending upon the metal, quality of water and the species of fish tested. Toxicity of zinc and copper to *P. conchoni* was markedly increased by reducing hardness of water. Singh and Singh (1982) observed marked changes in the various blood parameters of *Mystus vittatus* after exposure to various concentrations of copper and zinc sulphate. There was increase in the hematocrit level, swelling of the erythrocytes and their nuclei after exposure to acute lethal concentrations (15 ppm Cu, 60 ppm Zn).

Several investigators have examined the histopathological effects of various pollutants on different organs of fishes. DDT is reported to cause excessive mucus secretion, detachment of epidermal, cells and vacuolization of cells in the skin of *Mystus vittatus*. Various pesticides like Endrin, Aldrin, Thiodon, Malathion, Endosulfan etc., cause excessive mucus secretion, disintegration of cells, necrosis and damage of the respiratory epithelium of the gills. Swelling of the RBC's and their clumping together has been reported in acutely poisoned fish. Hypertrophy of the hepatic cells, necrosis and vacuolization has been observed in the liver on exposure to DDT, Dieldrin and Heptachlor. Even sub-lethal doses of some pesticides are reported to produce degeneration, hypertrophy and necrosis in liver cells. Mucous membrane, epithelial lining and the sub mucosa of the stomach and the intestine undergo degeneration and rupture due to toxic effects of various pollutants.

It is difficult of estimate the exact effect of pollution and the problem needs careful laboratory and field experiments, but there is no doubt that various changes brought about in the ecological conditions of the environment prove harmful and even fatal to the fishery of the region.

***Research Scholar
Department of Zoology
VKSU Ara (Bihar)**

REFERENCES:

1. Kumar, S. and Pant, S.C. 1981. *Ind. Jnl. Exptl. Biol.* 19 :19 Mathur, D.S. 1972. *Toxicon.* 8 (2) 141-142.
2. Pant, S.C. Kumar, S. and Khanna, S.S. 1980. *Comp. Physiol. Ecol.* 96 (3) : 146-149.
3. Sastry, K.V. and Sharma, K.K. 1979. *Ind. Jnl. Exptl. Biol.* 16 : 372-373. 1981. *Matsya*, 7 : 66-69.
4. Singh, H.R. and Singh, B.R. 1982. *Matsya*, 8 : 1-6.
5. Kumar, S. and Pant, S.C. 1988. *Bull. Environ. Contam. Toxicol.* 41 : 227-232 1993. *Adv. In Limnology* Narendre Publ. House, Delhi.

Pollution of Water and ITS Effects on Fisheries

Dr. Kumari Sugandha Priya